Endovascular Treatment of Basilar Artery Aneurysms Associated with Distal Fenestration

A Case Report

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Summary

Segmental non-fusion of the basilar artery results from failed fusion of the neural arteries and from regression of the bridging arteries that connect the longitudinal arteries.

This condition is associated with aneurysm formation in 7% of cases. Distally unfused arteries with associated aneurysms are very rare. We report on a case of successful endovascular treatment of an aneurysm of the distally unfused basilar trunk.

Introduction

Partially unfused basilar arteries occur as a result of failure of fusion of the neural arteries and of regression of the bridging arteries that connect the longitudinal arteries [1-3].

This condition results from a developmental anomaly of brain arteries. Non-fusion of the basilar artery (BA) has a reported angiographic prevalence of 0.1% to 0.6% [4,5]. However, postmortem studies have shown the frequency to be as high as 5.26% [5]. After the vertebral artery, the BA is the second most common site of fenestration of intracranial arteries [6].

Like arterial bifurcations, arterial fenestrations as a consequence of developmental anomalies of cerebral arteries have a tendency to develop aneurysms due to medial defects [7,8]. It has been reported that 35.5% of aneurysms of the vertebrobasilar junction were associated with non-fusion of the proximal basilar artery [9]. Basilar artery fenestrations were accompanied by aneurysms in 7% of cases [10]. Aneurysms associated with proximal non-fusions are more common than those associated with distal non-fusions [3,11]. Considering the complex geometry of the fenestration, the close proximity to the brainstem and lower cranial nerves, the multiple small perforating arteries arising from the basilar artery and the difficulties of appropriate surgical exposure, clipping of these aneurysms seems to be risky [3,7,11,12]. Hence, endovascular treatment of these aneurysms is a preferred alternative to surgery. While there have been several cases of endovascular treatment of fenestrated BA aneurysms reported [2,3,7,11-14], only two of them [3,11] described the endovascular embolization of BA aneurysms associated with distal basilar segmental non-fusion.

We report on a case of endovascular treatment of a ruptured aneurysm of a partially unfused BA.

Case Report

A 26-year-old man was admitted to hospital with acute onset of a severe headache. A computed tomography (CT) scan revealed subarachnoid haemorrhage predominantly around the brain stem, suggesting bleeding from an aneurysm in the posterior circulation. He was

Figure 1 Digital subtraction angiography (DSA) of the left vertebral artery showing the aneurysm arising at the proximal end of associated fenestration at the distal basilar artery. The aneurysm directed anteriorly, 2.6 x 1.7 mm in diameter.

Figure 2 Left vertebral angiography after endovascular embolization displaying complete occlusion of the aneurysm.

assessed as being Grade II on the Hunt and Hess scale.

A vertebral artery angiogram showed an aneurysm measuring 2.6 x 1.7 mm in diameter arising at the proximal part of the partially unfused BA (Figure 1). The fenestration involved a segment of the distal BA just below the level of the superior cerebellar arteries. The patient was scheduled for endovascular coil embolization of the aneurysm because this method is the treatment of choice in our center.

The procedure was performed under general anaesthesia five days after ictus. The left vertebral artery was catheterized using a Casasco 6F guiding catheter (Balt, Montmorency, France). A Vasco+10 microcatheter (Balt, Montmorency, France) was then inserted into the aneurysm sac. The aneurysm was embolized with mechanically detachable soft type coils (Balt, Montmorency, France) (total length 6 cm). Postembolization control angiography revealed total occlusion of the aneurysm and of both limbs of the partially unfused BA (Figure 2). The patient was discharged from the hospital four days after the procedure with a Glasgow Outcome Score of 5.

Discussion

Study of the anatomy and microstructure of arterial non-fusions revealed that the intrinsic architecture of the lateral walls of the unfused artery is normal. The media however, is locally absent and elastin is discontinued at the proximal and distal edges of the non-fusion [8]. Moreover, the subendothelium is thickened distally and thinned proximally [8]. These factors and the alteration in the flow of hemodynamic forces at the junctions of the non-fusion favor formation of an aneurysm in this area [3,11]. Aneurysms associated with proximal non-fusions are more common than those associated with the distal non-fusions [3,11]. To the best of our knowledge, only two [3,11] of the few cases of aneurysms with distal BA fenestration reported [3,11,15,16] described endovascular treatment of these aneurysms.

Endovascular treatment of intracranial aneurysms has gained wide acceptance since its introduction into clinical use in 1990 [17]. In addition, endovascular embolization has been applied as an alternative to open surgery in cases of aneurysms of partially unfused BA [3,7,11-14]. Islak et Al. reported on a series of ten cases of endovascular treatment of 11 aneurysms of

partially unfused BA, including seven after subarachnoid haemorrhage [3]. Complete embolization was achieved in ten aneurysms, while a neck remnant was observed in one case [3]. Two segmental non-fusions in this series were located in the distal part of the BA.

In our case, segmental non-fusion was located at the distal part of the BA. Complete embolization was achieved with two coils of a total length of 6 cm.

A good visualization of these complex aneurysms, as well as a good working projection are prerequisites for their successful embolization. The aneurysm itself may obscure the non-fusion and the anomaly may easily overlooked be because of the short unfused segment [18]. Some authors recommend the application of three-dimensional digital subtraction angiography (3D-DSA) to understand the anatomical environment of the aneurysm and determine the best approach to its treatment [7]. In our case, despite the small diameter of the aneurysm, we were able to visualize its neck and position properly in relation to both trunks of the BA. The aneurysm was embolized successfully.

Both limbs of the unfused BA carry brainstem perforators to their respective sides [13]. Hence, occlusion of one limb carries a risk of unilateral brainstem ischemia [13]. Islak et Al. treated one patient endovascularly with one loop sacrifice without clinical sequelae [3].

Our case, evaluated along with previously reported cases, further supports the evidence that endovascular treatment of aneurysms of the fenestrated BA may be an effective and viable option for treatment of these unique vascular anomalies.

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